SPEAKEASY PHONEME EDITOR

OPERATING INSTRUCTIONS

VERSION 1.0

PERSONAL PERIPHERAL PRODUCTS
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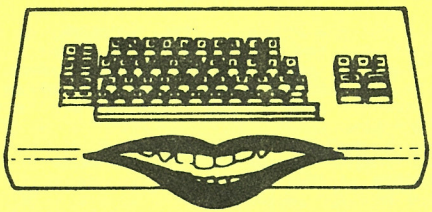

1. GENERAL

The phoneme editor program is designed to help you develop words, phrases, sentences, and paragraphs for Personal Peripheral Products' SPEAKEASY speech synthesizer board for the VIC-20 computer. The phoneme editor consists of two programs: the phoneme editor and the phoneme speaker. These two programs are all that is required to make your SPEAKEASY say anything you want. The phoneme editor allows you to select, edit, and listen to phonemes and phoneme strings on your VIC-20. The phoneme strings can be stored in a data file on a cassette or disk. These data files can be loaded back into the phoneme editor at a later time for more editing or into an applications program to provide the desired speech. The phoneme speaker program is provided to allow you to hear the phoneme strings that have been stored in the data files created by the phoneme editor.

2. HARDWARE INSTALLATION

The minimum hardware required to run the phoneme editor and speaker programs is:

- SPEAKEASY speech board
- VIC-20 computer
- C2N cassette unit
- television

Optional hardware includes:

- VIC-1540 or VIC-1541 floppy disk drive
- memory port expansion board
- VIC-20 RAM expander board

If you plan to run the phoneme editor program, no RAM expander boards can be plugged into the VIC. The VIC must not have any additional memory installed in order for the phoneme editor program to work properly. The RAM expander board is only required if you want to use the phoneme speaker program and listen to a file that has more than 1024 phonemes in it.

Follow these steps to insure that the hardware is configured properly to run the phoneme editor and speaker programs:

a. Make certain that all memory expansion boards and game cartridges are removed or disabled from the VIC.

b. Connect the C2N cassette unit to the VIC in accordance with their appropriate manuals' instructions.

c. Connect the VIC-1540 or VIC-1541 floppy disk drive to the VIC in accordance with their appropriate manuals' instructions. Note this step is only required if you plan to use a floppy disk as the storage medium for the phoneme string data files created by the phoneme editor. If you plan to use cassette tape for the storage medium omit this step.

d. If a memory port expansion board is going to be used, install it in the VIC's memory expansion port. Install the SPEAKEASY speech board into the memory port expansion board (if used) or the

memory expansion port itself. Refer to the SPEAKEASY manual for proper installation instructions.

You are now ready to run the programs

3. SOFTWARE INSTALLATION

The cassette tape provided for the SPEAKEASY phoneme editor and speaker programs, contains four files: PHONEME EDITOR/T, PHONEME SPEAK/T, PHONEME EDITOR/D, and PHONEME SPEAK/D. The programs with the /T suffix are for the cassette tape I/O version. The programs with the /D are for the floppy disk I/O version. You must make a decision at this point whether to use cassette tapes or floppy disks as your phoneme data file storage medium. Please note that there is no utility provided in this package for transferring data files from tape to disk or disk to tape. If you load and run a program with a /T suffix it can only read and write tape data files. Conversely a /D suffix program can only read and write disk data files.

If you plan to use cassette data files skip to the next section.

If you have a disk drive, you can always load the phoneme editor and speaker programs from tape. It would be much easier and faster if the editor and speaker programs were on a disk so that they could be loaded from the disk instead of the tape. Perform the following steps to transfer the editor and speaker programs from the tape to a disk:

a. Turn on the VIC (You do not have to have the SPEAKEASY board installed in order to accomplish the transfer to disk). The screen should display:

```
3583 BYTES FREE

READY.
```

b. Install the phoneme editor/speaker cassette in the cassette unit and make certain that the tape is rewound and stopped.

c. Transferring the editor program from tape to disk is a little more difficult than a standard tape to disk transfer. The phoneme editor program uses all of the available VIC's memory. If you try to save the editor program using a normal transfer procedure, you will get an error message: ?OUT OF MEMORY, ERROR. We have found a tricky way around this problem. We must borrow some memory from the screen memory buffer. We will borrow the 1st line of screen memory (22 bytes) and this will allow you to transfer the editor to disk.

d. On the VIC keyboard type:

```
LOAD "PHONEME EDITOR/D"(RETURN).
```

Note (RETURN) means the RETURN key on your VIC.

e. The VIC will display on its screen:

```
PRESS PLAY ON TAPE.
```

f. Press the PLAY button on the cassette player and the VIC will display:

OK
SEARCHING FOR PHONEME EDITOR/D

After a short wait the VIC will display:

FOUND PHONEME EDITOR/T

After another short wait the VIC will display:

FOUND PHONEME SPEAK/T

After another short wait the VIC will display:

FOUND PHONEME EDITOR/D

LOADING

After another short wait the VIC will display:

READY.

g. You now must type:

POKE 51,22(RETURN)

This borrows 22 bytes from the screen buffer. Now type:

(SHIFT)/(CLR/HOME)

Press the (CLR/HOME) key while holding down the (SHIFT) key. This clears the screen. Now type:

(RETURN)

This skips the first line, which we just borrowed for the transfer.

h. Now make certain that the disk you wish to save the editor on is formatted and in the disk drive then type:

SAVE "PHONEME EDITOR/D",8(RETURN)

The VIC will whirl the disk drive for a little while and then the screen will display:

READY.

The disk based editor program is now on the disk.

i. The transfer of the speaker program uses a standard tape to disk procedure. Make certain that the phoneme editor/speaker cassette is in the cassette unit, rewound, and stopped. On the VIC keyboard type:

SYS64802(RETURN)

To reset the screen memory that we just borrowed, now type:

LOAD "PHONEME SPEAK/D"(RETURN).

j. The VIC will display on its screen:

PRESS PLAY ON TAPE.

k. Press the PLAY button on the cassette player and the VIC will display:

OK
SEARCHING FOR PHONEME SPEAK/D

After a short wait the VIC will display:

FOUND PHONEME EDITOR/T

After another short wait the VIC will display:

FOUND PHONEME SPEAK/T

After another short wait the VIC will display:

FOUND PHONEME EDITOR/D

After another short wait the VIC will display:

FOUND PHONEME SPEAK/D

LOADING

Then after a little longer wait the VIC will display:

READY.

l. Insert a disk into the disk drive that you wish to save the speaker program on (make certain that it is formatted). Now you must type:

SAVE "PHONEME SPEAK/D",8(RETURN)

The VIC will whirl the disk drive for a little while and then the screen will display:

READY.

You have now completed transferring the speaker and editor programs to disk and you are ready to run them.

4. PHONEME EDITOR OPERATION

a. Turn on the VIC. The screen should display:

3583 BYTES FREE

READY.

If there are more than 3583 bytes free, it means that you have not removed your memory expansion board. Turn off your VIC and remove it now. The phoneme editor will not run if you proceed.

b. Install the phoneme editor cassette in the cassette player and make certain that the tape is rewound and stopped, or install the phoneme editor disk in the disk drive if you are using disk to load the editor.

c. If using tape, type:

LOAD "PHONEME EDITOR/T"(RETURN)

Note (RETURN) means the RETURN key on your VIC.

If using disk, type:

LOAD "PHONEME EDITOR/D",8(RETURN)

d. If using tape, the VIC will display on its screen:

PRESS PLAY ON TAPE

e. If using tape, press the PLAY button on the cassette unit.

f. The VIC will display:

OK

SEARCHING FOR PHONEME EDITOR/T (or /D)

After a short wait the VIC will display:

FOUND PHONEME EDITOR/T (only if using tape)

LOADING

Then after another short wait the VIC will display:

READY.

You now must type:

RUN(RETURN)

The VIC screen will display a copyright notice for about 10 seconds and then the phoneme editor screen format will appear.

Before explaining the commands available in the phoneme editor let's examine the phoneme editor's screen format. In the upper left hand corner of the screen is a table of 64 symbols (8 lines with 8 symbols per line). These symbols represent the 64 phonemes that can be used to generate speech. Each of these symbols occupies a single character space on the screen, even though some symbols look like two characters. The phoneme symbols are designed to be as similiar to the standard VOTRAX phoneme symbols as possible. The VOTRAX symbols contain a maximum of 3 letters (except STOP). These symbols have been compressed in the phoneme editor into one character space for easy editing. Some of the suffix numbers on the VOTRAX symbols are replaced by corresponding dots on top of the phoneme editor symbols. For example VOTRAX symbols EH3, EH2, and EH1 are replaced by EH, EH, and EH. The standard VOTRAX symbols and the corresponding phoneme editor symbols are listed in table 1. Some of the VOTRAX symbols have

been completely redefined for use in the phoneme editor. These symbols are listed in table 2 as well as table 1. The lower half of the phoneme editor screen is the phoneme editor's work buffer. This buffer will hold a maximum of 256 phonemes at any one time. Initially this buffer is filled with STOP phonemes. Since the symbol for the STOP phoneme is a small square equal to one character size, the initial phoneme buffer is completely blue.

It is now your task to select phonemes from the table in the upper left hand corner of the screen and place them into the phoneme buffer in the correct sequence. The phoneme editor has several commands available to make this cumbersome job as simple as possible.

The basic operation of the phoneme editor is to manipulate the cursor and thereby manipulate the phonemes. When the phoneme editor is first run, the cursor is placed in the phoneme symbol table on the E phoneme symbol. The position of the cursor in the phoneme editor program is identified by the blinking character position. the cursor can be moved back and forth from the phoneme symbol table to the phoneme buffer by pressing the F7 key. When the cursor is not in the phoneme symbol table, the last position of the cursor in the table is denoted by the yellow symbol. The last position of the cursor in the phoneme buffer is shown in the same way. The two cursor movement keys can be used to move the cursor around in either the phoneme symbol table or the phoneme buffer.

Now let's examine the phoneme editor commands. The commands are all single key commands. You do not have to type (RETURN) after each command.

-This key moves the cursor down one line. If the SHIFT key is held down while pressing this key, then the cursor moves up one line. Note that the cursor will wrap around. This means that if the cursor is at the bottom line and the cursor is moved down one more line, the cursor will be place on the first line. If the cursor is on the top line and it is moved up one line, it will be placed on the bottom line. Regardless of whether the cursor is in the phoneme symbol table or the phoneme buffer (see the F7 command), this command works the same.

-This key moves the cursor to the right one phoneme position. If the SHIFT key is held down while pressing this key, then the cursor moves to the left one phoneme position. Note that the cursor will wrap around. Regardless of whether the cursor is in the phoneme symbol table or the phoneme buffer (see the F7 command), this command works the same except for the wrap around. If the cursor is in the phoneme symbol table and at the rightmost phoneme position on a line and the cursor is moved to the right, the cursor will be placed on the leftmost character of the same line. If the cursor is at the leftmost position and it is moved to the left, it will be placed in the rightmost position on the same line. If the cursor is in the phoneme buffer and at the rightmost phoneme position on a line and the cursor is moved to the right, the cursor will be placed on the leftmost character position of the next line. If the cursor was at the end of the buffer, it will be moved to the

beginning of the buffer. If the cursor is in the phoneme buffer and at the leftmost phoneme position on a line and the cursor is moved to the left, the cursor will be placed on the rightmost character position of the previous line. If the cursor was at the beginning of the buffer, it will be moved to the end of the buffer.

C -Pressing the C key will clear the buffer (i.e fill the buffer with STOP phonemes). Since accidently pressing this key could be disastrous, the program will ask you "ARE YOU SURE?". If you really want to clear the buffer type: Y(RETURN). If you do not want to clear the buffer just type (RETURN) and the buffer will not be cleared.

R -Pressing the R key will read a data file into the phoneme buffer. The data will be placed in the phoneme buffer starting at the location of the yellow pointer. Therefore it is important that you position the yellow pointer to the desired location before executing the R command (use the CRSR and F7 commands). The program will ask you for a file name. Everytime you use the R command, it reads until the phoneme buffer is full (256 phonemes maximum) or until an end of file mark is reached. If an end of file mark is encountered, the next time you use the R command, it will ask you for a new file name. If an end of file mark is not encountered, the next time you use the R command, it will not ask you for a file name but it will load the remaining phonemes in the data file into the buffer. This will continue until an end of file mark is read. The R command provides a method for appending several data files into the phoneme buffer.

W -Pressing the W key will write a data file with the data that is currently in the phoneme buffer. This command will write the data from the beginning of the buffer up to and including the position of the yellow pointer. Therefore it is imporant that you position the yellow pointer to the last phoneme that you want to save before executing the W command (use the CRSR and F7 commands). The operation of the W command differs depending on whether you are using tape or disk.

USING CASSETTE DATA FILES:

Due to some problems encountered when using the VIC's cassette software, the editor will only permit you to write a data file with a maximum of 256 phonemes (one phoneme buffer). When using the W command and cassette data files the editor will automatically close the data file upon completion of the W command. This type of operation is necessary because the cassette software uses the same RAM data buffer for reading and writing to the tape. Therefore it is possible that data previously written to the tape could get lost if a R command is executed before the newly written data file is closed. In order to avoid this potential problem, the editor will close the file

automatically. This places the 256 maximum phoneme data file restriction. If you find this restriction too limiting refer to section 7 for relief.

Everytime the W command is executed using cassette data files the editor will ask for the file name:

FILE NAME?

Enter the desired file name, end the file name by typing (RETURN). The VIC will then display on its screen:

TAPE READY?

Make certain that the cassette is in the cassette unit, that the tape is positioned where the data file is to be written on the tape, and that the cassette unit is stopped. When this has been accomplished type:

Y(RETURN) or just (RETURN)

If you wish to abort the W command at this point type:

N(RETURN)

The program will return with the data buffer intact. If you did not abort the screen will then display:

PRESS RECORD & PLAY ON TAPE

Respond by holding down the RECORD button on the cassette unit and press the PLAY button (the RECORD button must be pressed and held before pressing the PLAY button). The screen will respond:

OK

After a short wait, the program will return to the editor with the original buffer intact. A file with the specified file name has been opened, written, and closed.

USING DISK DATA FILES:

The W command when using disk data files allows you to make multiple writes to the same data file. A very large data file can be created by using the W command several times. The first time you use the W command, it will ask you for a file name. It will not ask you for a file name if you use the W command again. Everytime you use the W command it will write the phonemes contained in the phoneme buffer from the beginning of the buffer to the yellow pointer into the data file specified by the file name you gave. IMPORTANT: AFTER WRITING ALL THE DATA YOU WANT IN ONE DISK DATA FILE YOU MUST EXECUTE A "0" COMMAND TO CLOSE THE FILE YOU ARE WRITING AND END THE EDITING SESSION, OR YOU WILL LOSE THIS DATA FILE.

Whether using tape or disk data files, with the W command

you can read in several data files and only write one data file. This provides a method of concatenating several data files into one. This feature can be used to create phrases or sentences if individual words have been stored in unique data files. Remember, if using tape files, the concatenated file can not be longer than 256 phonemes (see section 7 if this is a problem).

Q -Pressing the Q key will end the phoneme editor and close all opened files. REMEMBER ALWAYS USE THE "Q" COMMAND TO END EDITING. If you accidently push the Q key and you don't want to lose the contents of your phoneme buffer, type CLOSE2:CLOSE3:CLOSE15(RETURN) to close all data files. Then type GOTO3(RETURN). This will restart the phoneme editor without clearing the buffer. If you type RUN(RETURN), the phoneme editor will be restarted but the phoneme buffer will be cleared.

Do not use the RUN STOP key to stop the program. If you accidently push the RUN STOP key you can still save your data file (if you are writing one and it has not been closed yet) by pushing the RUN STOP and RESTORE keys simultaneously, and then type CLOSE2(RETURN).

F1 -Pressing the F1 key will pronounce the phoneme in the phoneme symbol table that the cursor is currently blinking. You can use the F1 key to find the phoneme that gives you the sound you want.

F3 -Pressing the F3 key will change the inflection level of the phoneme currently pointed to by the cursor. There are four different levels. The F3 command will select the next inflection level in a round robin fashion (i.e. each press of F3 will give you a new inflection level).

F5 -Pressing F5 will put the blinking phoneme in the phoneme symbol table and the current inflection level into the phoneme buffer at the location identified by the yellow pointer in the phoneme buffer. The yellow pointer will move to the next position in the buffer. If the yellow pointer was at the end of the buffer, one more F5 will wrap the yellow pointer around to the beginning of the buffer. The F5 command is a direct replace command. The phoneme at the yellow pointer position will be replaced with the phoneme that is currently blinking in the phoneme symbol table. If the cursor is in the phoneme buffer when F5 is pressed, the first press of F5 will move the cursor to the phoneme symbol table and all subsequent presses of F5 will operate as described above.

F7 -Pressing the F7 key moves the blinking cursor back and forth between the phoneme symbol table and the phoneme buffer. The current location of the cursor is identified by the blinking phoneme symbol. The yellow symbol pointer identifies the phoneme position that the cursor will be returned to when the F7 command is executed. The cursor can be moved within the phoneme symbol table and the phoneme buffer by using the CRSR commands.

D -The D command is only active when the cursor is in the phoneme buffer. Pressing the D key will delete the phoneme from the phoneme buffer that is identified by the blinking cursor. All phonemes to the right of the cursor will be shifted one position to the left to fill the position left empty by the deleted phoneme. The last position in the phoneme buffer will be filled with a STOP phoneme. ALL KEYS HAVE AUTOMATIC REPEAT, SO DON'T PRESS THE "D" KEY TOO LONG OR SEVERAL PHONEMES WILL BE DELETED. The auto-repeat can be used if you want to delete a long string of phonemes.

I -The I command is only active when the cursor is in the phoneme buffer. Pressing the I key will insert the phoneme identified by the yellow pointer in the phoneme symbol table into the phoneme buffer at the location identified by the blinking cursor. All of the phonemes to the right of the cursor will be shifted to the right one position to make room for the new phoneme. The phoneme at the end of the buffer will be shifted out of the buffer and lost. ALL KEYS HAVE AUTOMATIC REPEAT, SO DON'T PRESS THE "I" KEY TOO LONG OR SEVERAL PHONEME INSERTIONS WILL BE MADE. The auto-repeat can be used if you want to insert several identical phonemes.

S -The S command is only active when the cursor is in the phoneme buffer. Pressing the S key will tell the SPEAKEASY to begin speaking the phoneme buffer from the current blinking cursor position to the next STOP phoneme. It is a good idea to put STOP phonemes between words so that you can use the S command to listen to each word individually and make any editing changes necessary. After the editing is complete, the STOP phonemes can be removed. The yellow pointer will move through the phoneme buffer as the phonemes are heard.

SPACE -The SPACE bar command is only active when the cursor is in the phoneme buffer. Pressing the SPACE bar will cause the SPEAKEASY to speak the phoneme buffer from the beginning to the blinking cursor. The yellow pointer will move through the phoneme buffer as the phonemes are heard.

Pressing any other keys except those noted above will cause the cursor to return to the phoneme symbol table if it is not already there.

5. OPERATION OF THE PHONEME SPEAKER

The phoneme speaker program will read a phoneme data file previously created by the phoneme editor. Since you can read and write many times when editing using the phoneme editor, the size of the data file

is only limited to the amount of storage available on your tape or disk. When you run the phoneme speaker, it will ask you for the maximum number of phonemes it should expect from the data file. This should be determined by how big your phoneme data file is and the memory size of your VIC. If you simply type (RETURN), the program will default to a maximum of 1024 phonemes. The default buffer size will fit in an un-expanded VIC.

a. If you just finished using the phoneme editor program and exited it using the "O" command, type:

SYS64802(RETURN)

This will restore all of VIC's pointers so that the speaker program can be loaded. Then proceed to step b. If you did not just use the editor, turn on the VIC. The screen should display:

3583 BYTES FREE

READY.

The number of free bytes displayed may vary if you have a memory expansion board installed. Unlike the editor, the phoneme speaker program will run with expanded memory installed. Install the phoneme editor cassette in the cassette unit and make certain that the tape is rewound and stopped or install the phoneme editor disk in the disk drive if you are using disk to load the speaker program.

b. If using tape, type:

LOAD "PHONEME SPEAK/T"(RETURN)

Note (RETURN) means the RETURN key on your VIC.

If using disk, type:

LOAD "PHONEME SPEAK/D",8(RETURN)

c. If using tape, the VIC will display on its screen:

PRESS PLAY ON TAPE.

d. If using tape, press the PLAY button on the cassette unit.

e. The VIC will display:

OK
SEARCHING FOR PHONEME SPEAK/T (or /D)

If using tape, after a short wait the VIC will display:

FOUND PHONME EDITOR/T

If using tape, after another short wait the VIC will display:

FOUND PHONEME SPEAK/T
LOADING

Then after another short wait the VIC will display:

READY.

You now must type:

RUN(RETURN)

f. The screen will respond by displaying a copyright notice for about ten seconds and then the screen will display:

PHONEME SPEAKER

MAX PHONEMES?

You must answer this question with a number greater than the largest data file that you would like to listen to. If you answer by pressing (RETURN), the program will default to a maximum number of 1024. This is equal to writing 4 full phoneme buffers using the phoneme editor program and the W command. This default buffer size of 1024 will fit in an unexpanded VIC. If you got an OUT OF MEMORY ERROR, when using the default it means you did not execute a SYS64802 command as requested in step a. If you have a data file larger than 1024 phonemes, you will have to install a RAM expansion board in order to listen to the complete file.

g. The program will then ask you to enter a file name:

FILE NAME?

you must respond with : file name(RETURN), where the file name is the name of the data file that you wish to hear.

h. The program will then ask you if you want the phonemes' decimal value to be listed on the screen while they are being spoken:

LIST PHONEME?

You must enter: Y(RETURN) or N(RETURN) depending on your preference.

i. If using disk, proceed to step j. If using tape, the program will then respond:

TAPE READY?

Make certain that the tape with the desired file is in the cassette unit, rewound, and stopped. When the tape is ready type: Y(RETURN) or (RETURN). The screen will then display:

PRESS PLAY ON TAPE

Press the play button on the cassette unit and the screen will respond with:

OK

j. The program will then respond by displaying the phoneme sequence number as it is read from the tape or disk:

```
READING PHONEME #
XX
```

The program then begins speaking and displaying (if selected) the phonemes in the data file.

k. At the end of the data file, the program will respond with:

```
AGAIN?
```

You must enter Y(RETURN) to hear the same data again or N(RETURN) to exit the speaker program.

6. HOW TO USE A DATA FILE IN YOUR OWN PROGRAM

If you create a phoneme data file that you would like to use in your own programs or games, the phoneme speaker program provides the best example of how to retrieve these data files. The phoneme speaker program is written entirely in basic. We suggest that you load the phoneme speaker program and run a listing. In the PHONEME SPEAK/D program, after line 220 (in PHONEME SPEAK/T it is line 210) is executed, all the phonemes in the data file are stored in the array: PH%. You can use the phoneme string in the array PH% anytime you want to speak the data in the data file. Use the examples in the "SPEAKEASY INSTALLATION and OPERATION MANUAL" for further guidance. These examples are only meant to get you started and are by no means the only way to use the SPEAKEASY or the data files.

Data files are sequential hex files. They are not basic files. Each phoneme requires one byte of storage. The data stored for each phoneme is the data listed in the CODE column of table 1 plus the inflection level value. When using cassette data files a special case must be considered for the EH3 phoneme when it has an inflection level of 0. A EH3 phoneme with an inflection level of 0 has a data value of 0. When a data value of 0 is read from a cassette file it is recognized as an end of file. This is unacceptable, therefore the cassette editor program automatically tranforms a 0 data value into a FF value. An FF value is a STOP phoneme with an inflection level of 3. Since the STOP phoneme produces no sound the inflection level is meaningless. The cassette phoneme editor whenever it encounters a STOP phoneme when executing a W command will write a 3F data byte regardless of the inflection level setting. Therefore if you plan to incorporate a cassette data file into your program you must account for this anomaly. Again the phoneme speaker program for cassette provides an excellent example of how to accomplish this.

7. CUSTOMER MODIFICATION OF THE EDITOR

If you find the 256 maximum data file too restricting when using cassette data files, you can make the following program modification to allow you to write longer data files. Note this only applies to the cassette version.

Load the cassette phoneme editor as described in section 4, but do not run the program. Now you must change line 49, originally line 49 is:

```
NEXTI:W=0:CLOSE2:GOTO3
```


Line 49 must be changed to:

```
NEXTI:GOTO3
```

After changing line 49 you can run the program. Be careful, you must always execute a O command before executing a R command if a W command has been executed previously. In other words you must always close a write file before reading from any other file, or data will probably be lost in the write file.

8. PERSONAL PERIPHERAL PRODUCTS LIMITED WARRANTY

PERSONAL PERIPHERAL PRODUCTS reserves the right to make improvements in the product described in this manual, at any time, without prior notice. Owners of previous versions may trade up at a nominal cost to themselves.

PERSONAL PERIPHERAL PRODUCTS software is sold "as is". The buyer assumes the entire risk as to quality and performance. PERSONAL PERIPHERAL PRODUCTS warrants to the original purchaser only, that the medium on which the program is recorded will be free from defects in materials and faulty workmanship under normal use, service and conditions for a period of ninety (90) days from the date of purchase. If a defect in the medium should occur during this period, return it postage prepaid and insured, with your name, address, proof of the date of purchase and a brief description of the problem to PERSONAL PERIPHERAL PRODUCTS, P.O. BOX 3423, AURORA, ILLINOIS 60505. If your medium is found to be factory defective during the first 90 days, it will be repaired or replaced at no cost to you. The sole and exclusive remedy in the event of a defect is limited to replacement or repair of the medium as provided above. If your medium is found to have been consumer damaged or abused and therefore not covered by this warranty, then you will be advised, in advance, of the repair costs. This warranty is made in lieu of any other express warranty, and except for the foregoing warranty which is exclusive, there is no other express warranty being made. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

If your medium requires service after the expiration of the 90 day limited warranty period, PERSONAL PERIPHERAL PRODUCTS will service the medium and put it in working condition or replace it with a reconditioned medium (at our option), upon receipt of your medium, postage prepaid and insured, with your check payable to PERSONAL PERIPHERAL PRODUCTS in the amount of $7.00.

When returning a medium for service (in warranty or not) please allow 4 to 6 weeks for repair and return.

CODE	VOTRAX SYMBOL	EDITOR SYMBOL	DUR (MS)	EXAMPLE	CODE	VOTRAX SYMBOL	EDITOR SYMBOL	DUR (MS)	EXAMPLE
00/00	EH3	EH	59	less	32/20	A	A	185	able
01/01	EH2	EH	71	enemy	33/21	AY	AY	65	say
02/02	EH1	EH	121	pleasure	34/22	Y1	Y1	80	yellow
03/03	PA0	◢	47	no sound	35/23	UH3	UH	47	direction
04/04	DT	DT	47	button	36/24	AH	AH	250	pot
05/05	A2	A2	71	grade	37/25	P	P	103	put
06/06	A1	A1	103	grade	38/26	O	O	185	hold
07/07	ZH	ZH	90	vision	39/27	I	I	185	win
08/08	AH2	AH	71	father	40/28	U	U	185	who
09/09	I3	I3	55	credit	41/29	Y	Y	103	penny
10/0A	I2	I2	80	inhabit	42/2A	T	T	71	talk
11/0B	I1	I1	121	indigo	43/2B	R	R	90	red
12/0C	M	M	103	money	44/2C	E	E	185	eat
13/0D	N	N	80	run	45/2D	W	W	80	water
14/0E	B	B	71	ball	46/2E	AE	AE	185	back
15/0F	V	V	71	vein	47/2F	AE1	AE	103	apple
16/10	CH	CH	71	chalk	48/30	AW2	AV	90	flaw
17/11	SH	SH	121	shoe	49/31	UH2	UH	71	about
18/12	Z	Z	71	zoo	50/32	UH1	UH	103	but
19/13	AW1	AV	146	awful	51/33	UH	UH	185	up
20/14	NG	Ŋ	121	ring	52/34	O2	O2	80	toe
21/15	AH1	AH	146	hot	53/35	O1	O1	121	told
22/16	OO1	OO	103	looking	54/36	IU	IU	59	few
23/17	OO	OO	185	foot	55/37	U1	U1	90	you
24/18	L	L	103	laugh	56/38	THV	TH	80	then
25/19	K	K	80	pick	57/39	TH	θ	71	three
26/1A	J	J	47	judge	58/3A	ER	ER	146	bird
27/1B	H	H	71	heart	59/3B	EH	EH	185	wet
28/1C	G	G	71	gum	60/3C	E1	E1	121	see
29/1D	F	F	103	fat	61/3D	AW	AV	250	ball
30/1E	D	D	55	said	62/3E	PA1	◣	185	no sound
31/1F	S	S	90	grass	63/3F	STOP	■	47	no sound

NOTES: 1) Duration is measured when the clock is adjusted to 720 KHz.
2) "T" must precede "CH" to produce "CH" sound.
3) "D" must precede "J" to produce "J" sound.
4) the difference among EH, EH1, ETC. is duration.
5) STOP cancels all sound before the delay.
6) PA0 & PA1 allows sound to decay naturally during the delay.

PHONEME CHART -- TABLE 1

PHONEME CODE	VOTRAX SYMBOL	EDITOR SYMBOL	PHONEME CODE	VOTRAX SYMBOL	EDITOR SYMBOL
03/03	PA0	◢	57/39	TH	θ
19/13	AW1	AV	61/3D	AW	AV
20/14	NG	Ŋ	62/3E	PA1	◣
48/30	AW2	AV	63/3F	STOP	■
56/38	THV	TH			

VOTRAX VS. EDITOR PHONEME SYMBOL DIFFERENCES -- TABLE 2